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UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY—Circular No. 88.

THE AGRICULTURAL SITUATION FOR 1918

A SERIES OF STATEMENTS PREPARED UNDER THE DIRECTION OF THE SECRETARY OF AGRICULTURE

PART V

COTTON

MAINTAINING THE SUPPLY OF COTTON

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DEMAND FOR COTTON.

FROM THE STANDPOINT of meeting the world's demand for cotton and its by-products, the responsibility of the United States has increased greatly since the beginning of the war. Prior to 1914, this country was producing 55 to 68 per cent of the world's cotton crop, most of the balance being grown in India, China, Russia and Egypt, and these latter countries have been endeavoring to extend the cultivation of this crop. (See Table 1.) The war has caused some disturb-

TABLE 1.—*Principal cotton-producing countries, in order of importance.*

[Bales of 478 pounds net weight, or 500 pounds gross.]

Country.	1914	1915	1916	1917
United States	16,135,000	11,192,000	11,450,000	10,949,000
British India	4,359,000	3,128,000	3,576,000	....
Russia (Transcaucasia and Turkestan)	1,309,000	1,557,000	....	....
Egypt	1,337,000	989,000	1,248,000	....
Brazil	385,000	440,000	420,000	....
Peru (exports)	106,000	97,000	113,000	....
Korea	33,000	....	....	....
Uganda Protectorate	27,000	21,000	....	....
Dutch East Indies	[1] 19,000	....	....	....
Nigeria (exports)	12,000	6,000	....	....
Cyprus	9,498	5,619	....	....
Sudan (Anglo-Egyptian)	7,901	....	....	....
Siam	6,694	....	....	....
Nyasaland Protectorate (exports)	5,541	6,413	....	....
Philippine Islands	[2] 6,098	....	....	....
Japan	4,582	4,840	4,216	....
Leeward Islands (exports)	2,413	....	....	....
New Caledonia (exports)	1,596	2,124	....	....

[1] 1913 figures. [2] Census, 1902.

NOTE.—For China, a report of the Chinese Department of Agriculture and Commerce gives the cotton crop of that country for 1914 as about 2,099,000,000 pounds; but the translator was not able to determine whether this was ginned or unginned cotton. If unginned it would equal about 1,464,000 bales (500 pounds, gross); if ginned, it would equal 4,394,000 bales.

ance of the cotton industry in every country, including the United States. In some countries the cotton crop has been greatly reduced, so that now, even more than before the war, the world looks to the United States for its chief supply. (See Table 2.) This means that

TABLE 2.—*Exports of domestic raw cotton from the United States, by principal countries to which consigned, 1914 and 1917.*[1]

[Running bales.]

Country to which consigned.	Year ending June 30—		Increase, 1917 over 1914.	Decrease, 1917 under 1914.
	1917	1914		
Allies in Europe.	*Bales.*	*Bales.*	*Bales.*	*Bales.*
Belgium		216,825		216,825
France	1,023,127	1,091,137		68,010
Italy	660,571	517,011	143,560	
Portugal	28,806	6,323	22,483	
Russia (European and Asiatic)	145,229	94,726	50,503	
Serbia				
United Kingdom	2,793,388	3,451,966		658,578
Total, 7 Allies	4,651,121	5,377,988		726,867
Neutrals in Europe.				
Denmark	7,474	100	7,374	
Netherlands	59,092	34,614	24,478	
Norway	14,350	3,600	10,750	
Spain	366,262	285,158	81,104	
Sweden	100,046	48,609	51,437	
Switzerland	22,438		22,438	
Total, 6 Neutrals	569,662	372,081	197,581	
Enemies.				
Austria-Hungary		101,786		101,786
Germany		2,785,220		2,785,220
Total, 2 enemies		2,887,006		2,887,006
Other countries.				
Brazil	5,467		5,467	
Canada	186,849	146,992	39,857	
China	4,690	8,757		4,067
Japan	514,530	336,908	177,622	
Mexico	5,030	31,948		26,918
All other countries	9,816	3,620	6,196	
Grand total, all exports	5,947,165	9,165,300		3,218,135

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[1] Including lint cotton removed from the seed at oil mills.

From reports of the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce.

the production of cotton in 1918 should exceed the low yields of the past three years; and this should be accomplished principally through producing a larger yield per acre. (See Table 3.)

TABLE 3.—*Cotton: Acreage, production, and farm price in the United States, 1904-1917.*

[Figures for production, except 1917, are from the Bureau of the Census; other figures are from the Bureau of Crop Estimates.]

Year.	Acreage harvested.	Average yield per acre (net weight).	Production, excluding linters[1] (gross weight).		Average farm price, Dec. 1.	Linters[1] produced.
	Acres.	*Pounds.*	*Bales.*[2]	*Pounds.*	*Cents.*	*Bales.*
Annual average:						
1904-1908	30,361,000	193.3	12,327,163	6,163,582,000	9.7	281,392
1909-1913	34,152,000	181.1	13,033,235	6,516,618,000	12.2	502,711
1914	36,832,000	209.2	16,134,930	8,067,465,000	6.8	856,900
1915	31,412,000	170.3	11,191,820	5,595,910,000	11.3	931.141
1916	34,985,000	156.6	11,449,930	5,724,965,000	19.6	1,330,714
1917 (preliminary)	33,634,000	155.7	10,949,000	5,474,500,000	27.7	....

[1] The seed as marketed has a coating of short pieces of fiber, which has not been removed by the gin. This coating is taken off in the oil mills and is called "linters."

[2] Bales of 500 pounds gross.

The situation of the cotton industry deserves careful consideration, particularly with reference to the kinds of cotton grown. For some years this country has been gradually improving the quality of its cotton by increasing the length of the fiber or staple in the short-fiber varieties, and by growing a larger acreage of the more valuable longer-fiber cottons. The quantity of short-fiber cotton produced still amounts to about 92 per cent of the crop, and it would be difficult to emphasize unduly the desirability of expanding the acreage devoted to long-staple varieties. Of the long-staple now produced in this country, which contributes about 8 per cent of the total crop, about 7 per cent is of the Upland type, and 1 per cent is divided between Egyptian and Sea Island varieties. The principal areas of production of long-staple Upland are now found in the delta lands, extending through western and northwestern Mississippi, northeastern Louisiana, eastern and southeastern Arkansas and into Tennessee; groups of counties in northeastern and east-central Texas; four counties of South Carolina, and in a small area across the boundary in North Carolina; a group of counties along the Savannah River in Georgia and South Carolina; and small groups, or isolated counties, elsewhere. The replacing of many of the short-staple varieties which are now grown so extensively throughout the Cotton Belt, with long-staple Upland, would make it possible to furnish a larger part of the long-staple used in this country, for which it is now mainly dependent upon Egypt, Peru, and the West Indies. The war has accentuated the increasing demand for this type of cotton and at the same time has curtailed the normal importations. To aggravate the situation, several of the areas in the United States that heretofore have yielded a considerable supply of the Sea Island variety, which is most nearly comparable with the Egyptian cotton, have substituted short-staple varieties on account of infestation by the boll weevil, to which the Sea Island is more vulnerable because it takes longer to mature. Every consideration, therefore, urges producers to increase the supply of cotton of the longer-staple varieties.

HOW SUPPLY OF LONG-STAPLE COTTON WAS REDUCED.

The present deficiency of long-staple cotton is the result of a combination of several unusual circumstances. The reduction in the supply of long staples began with the boll weevil invasion of the Mississippi Delta region, which makes it unprofitable to grow the crop. This shortage of long-staple cotton confronted manufacturers with a serious problem. In spite of special inducements to cotton breeders and growers alike, the supply of long staples dwindled, and manufacturers were forced to adjust their machinery so as to handle short cotton. Consequently, the demand for long staple was reduced, and still further decrease of production was the result.

Moreover, the advance of the boll weevil brought about a general decline in the quality of the short cotton, because of the mistaken idea that only the small-boll, early-maturing types of cotton could mature a profitable crop in weevil territory. This view being widely accepted, there was much substitution of inferior varieties for those of better quality that were later maturing. Hence, the spinner began to use short staples in place of long, and the short staples used were of low quality.

EFFORTS TO RE-ESTABLISH LONG STAPLES.

The Department of Agriculture early recognized the danger of reducing our supplies of superior cotton and took steps to avert it. This work was begun in the State of Texas, where the weevils first established themselves, but has been extended to all the States of the Cotton Belt. All of the known factors or conditions tending to increase or diminish the power of the weevils to injure the crop were taken into account in devising means of protection and improvement of the crop under conditions of weevil infestation. As already stated, new early-maturing varieties of cotton have been developed, as well as new cultural methods of shortening the season of crop production, and these varieties and methods are being introduced in the eastern section of the Cotton Belt in advance of the arrival of the weevils. Even outside the area of weevil infestation the new varieties and methods are of practical value to the farmer in enabling him to secure earlier crops and lint of better quality, commanding a higher price in the market.

FUTURE DEMAND FOR LONG-STAPLE COTTON.

The present emergency is not the only reason why long-staple cotton production should be extended in this country. There is every reason to belive that a strong demand for long-staple cotton will continue after the war.

The demand for long staples was increasing even before the war, being brought about by the newer industries that had become, and very likely will remain, vital parts of our national industrial organization. The automobile tire manufacturers doubtless will continue to demand long-staple cotton and also the manufacturers of aeroplanes. The fact that automobile tire manufacturers recognize the high quality of thread and cord made from long staples and are bidding for that kind of material for use in making tires might be taken by the general public as a lesson on the wearing quality of cotton goods.

Egypt, Peru, and the West Indies are now the only competitors in this field, and there is no reason to expect any large accessions from them. India and China produce fiber of inferior quality, and it is not likely that they will soon substitute better types. Brazil, Mexico, and other tropical American countries may contribute, but there are many obstacles to be overcome before they can export cotton in large quantities.

COOPERATIVE EFFORTS BRING RESULTS.

In view of the existence of improved varieties of both short and long staple cotton and the practicability of using better cultural methods, the problem of meeting the present demands for cotton is not merely agricultural, but social and economic as well. What is needed is community organization of growers and the cooperation of manufacturers. Indeed, the entire consuming public should be more actively interested in the production and utilization of superior cotton fiber.

The production of the same superior variety of cotton in an entire community is of great benefit, since it tends to reduce deterioration through cross-pollination in the field or mixture of seed at the gin, and the quality of the stock can be maintained by selection. Neglect of these precautions is responsible for an enormous loss to the farmer, probably at least 10 per cent in yields and as much more in quality of fiber. Then, again, the production of commercial quantities of uniform fiber makes it possible to sell the community crop at a higher price than can be secured for the irregular product of unorganized communities. Better facilities for ginning, handling and marketing the crop are also most highly appreciated in progressive communities. Hence it is now the policy of the Department to encourage the organization of cotton-growing communities.

INCREASE THE PRODUCTION PER ACRE.

The low average yield of one-third of a 500-pound bale of cotton per acre in the United States leaves ample opportunity for increasing the total crop, without resort to an expansion of acreage beyond that planted normally. (See Table 4.) In all sections it should be possible to augment production materially by giving more attention to the growing of superior varieties and by adopting the improved cultural methods that have been developed. This can be done with very little increase in labor or in the cost of production. The acreage in the irrigated valleys of the Southwest, however, must be increased if the necessary supply of long-fiber Egyptian cotton is to be secured, and the Southwest is better adapted to the culture of this type of cotton than any other section of the United States.

TABLE 4.—*Cotton acreage, yield, and production by states,* 1915-1917.

State.	Acreage (000 omitted).			Yield per acre.			Production (000 omitted).		
	1917	1916	1915	1917	1916	1915	1917	1916	1915
	Acres.	*Acres.*	*Acres.*	*Lbs.*	*Lbs.*	*Lbs.*	*Bales.*	*Bales.*	*Bales.*
Virginia	45	42	34	170	310	225	16	27	16
North Carolina	1,453	1,451	1,282	187	215	260	570	655	699
South Carolina	2,876	2,780	2,516	205	160	215	1,235	932	1,134
Georgia	5,028	5,277	4,825	173	165	189	1,820	1,821	1,909
Florida	183	191	193	105	105	120	40	41	48
Alabama	2,195	3,225	3,340	110	79	146	505	533	1,021
Mississippi	2,801	3,110	2,735	153	125	167	895	812	954
Louisiana	1,350	1,250	990	218	170	165	615	443	341
Texas	11,052	11,400	10,510	135	157	147	3,115	3,726	3,227
Arkansas	2,645	2,600	2,170	162	209	180	895	1,134	816
Tennessee	857	887	772	115	206	188	206	382	303
Missouri	140	133	96	175	225	240	51	63	48
Oklahoma	2,838	2,562	1,895	150	154	162	890	823	640
California	117	52	39	275	400	380	67	44	29
Arizona	39	....	....	291	......	......	24	....	....
Other	15	25	15	......	......	......	5	14	7
United States	33,634	34,985	31,412	155.7	156.6	170.3	10,949	11,450	11,192

CHOOSE BEST VARIETY FOR LOCAL CONDITIONS.

It is generally recognized that most of the cotton now grown represents varieties that have deteriorated through admixture with other varieties, and besides producing fiber of inferior quality, yield less than pure strains. The choice of varieties, of which there are many, should be governed largely by local conditions of soil and climate and the prevalence of disease and insect pests. In the northern part of the Cotton Belt and in all regions where the season is shortened by drought or weevil infestation early-maturing varieties should be used. This, however, does not mean that quality should be sacrificed for earliness. There are superior varieties that have proved to be as early as the small-boll, inferior varieties. The mistaken idea that only the small-boll, quick-maturing types can mature a profitable crop in boll-weevil territory is to a considerable extent responsible for a general decline in the quality of the cotton crop in recent years.

Early-maturing varieties of superior quality, of both long and short staples, have been developed and are now grown extensively in certain parts of the Cotton Belt. The earliest of these is the short-staple variety Trice, which is grown by many farmers in the northern part of the Cotton Belt, especially in Tennessee and Virginia. Farther west, in Oklahoma, the acreage of the Mexican variety Acala, recently acclimatized, is being extended. In Texas and parts of the adjoining States the Lone Star, a Texas big-boll variety, has become one of the standard varieties, many thousands of acres of it having been grown in 1917. It may be said, in fact, that the Lone Star, the Acala, and the two older varieties, Triumph and Rowden, constitute the bulk of the cotton crop of Texas and Oklahoma. The same varieties are grown rather extensively also in Arkansas, and Lone Star has given good results even in South Carolina and Georgia, where the small-boll, short-staple varieties are now grown almost exclusively. The Durango variety, a Mexican long-staple, recently acclimatized by the Department of Agriculture, has done especially well under irrigation in some southwestern valleys, the Imperial Valley for example, and approximately 1,000 acres of this variety were grown last year in the vicinity of Portsmouth, Virginia. In the Mississippi Delta region and the Red River Valley of Texas, Foster, another long-staple variety, is grown to some extent, as are Kekchi and Columbia in southwestern Tennessee and Columbia, or Webber, in South Carolina.

The foregoing are a few of the superior varieties bred by the Department of Agriculture that are being successfully grown under weevil conditions and in regions subject to drought and early fall frosts. There are some good commercial varieties, probably more generally known, which are grown even more extensively than the newer varieties bred by the Department. Some of these are Triumph and Rowden in Texas and Oklahoma; King, Simpkins, Ideal, Cleveland, and Moneymaker, farther east; and Poulnot and Georgia Bigboll in the southeastern States. There are also other varieties of local importance in all parts of the Cotton Belt. The State experiment stations are breeding still other varieties and improved strains, seed of which probably is available. Hence, it is not so much a question of finding varieties that can be grown in different parts of the Cotton Belt as it is one of choosing the variety best suited to local conditions and establishing supplies of pure seed of that variety.

In Georgia and South Carolina, the Meade variety, a new Upland long-staple developed by the Department, promises to be an excellent substitute for the Sea Island cotton of Georgia and other mainland districts where Sea Island is not likely to be continued in cultivation beyond the present period of very high prices, owing to the presence of the boll weevil. The lint of Meade is comparable with that of Sea Island, being of fine quality and averaging 1$\frac{7}{16}$ to 1$\frac{1}{2}$ inches in length, and the new variety is earlier and has larger bolls. Steps are being taken to increase the available supply of Meade seed so that quantities will be available in 1918 for making extensive plantings of this variety.

The Mississippi Delta Region, the Red River Valley of Texas, and the southwestern part of Tennessee are especially well suited to the production of long staples. Though the Delta region is now producing most of our long-staple cotton, there is room there for a considerable extension of this type. The other places named are now growing only limited quantities of long staples, though much more could be grown. Considerable long-staple cotton is also produced in parts of the Piedmont region, especially in South Carolina, and its production there doubtless could be extended.

Egyptian and long-staple Upland cotton of high quality can be produced in the irrigated valleys of the southwestern States, and that region will have an advantage on the market sufficient to offset the greater freight rates to consuming centers, if only superior varieties of cotton are grown. Durango is perhaps the best long-staple Upland variety for that region, owing to its apparently greater adaptability to irrigation culture. Acala is also a very promising Upland cotton for the irrigated districts.

The culture of Egyptian cotton is now confined largely to the Salt River and Yuma Valleys of Arizona, but repeated experiments have proved that it may be grown successfully in other valleys of the Southwest, such as the Gila valley of Arizona, and the Upper Colorado, Imperial, and Upper San Joaquin Valleys of California. Two leading varieties of Egyptian cotton are especially suited to conditions in these valleys, namely, Yuma and Pima. The latter is a new variety of exceptional quality, selected from Yuma and very superior in every way.

There are likely to be 2,000 or 3,000 acres of Pima planted in San Joaquin and Sacramento Valleys, Calif., this year. Wherever Egyptian cotton is to be produced it should be grown exclusively in order to avoid mixing with other types and consequent deterioration. The same is true also in the case of other cotton of high quality. This can best be accomplished through community action, as already suggested.

INCREASE THROUGH CULTURAL PRACTICES.

Scarcely less important than the use of superior varieties in increasing production is the adoption of improved methods of culture. By giving special attention to the matter of securing good stands, much could be done toward increasing production. The seed used should have a high percentage of germination and should be planted at a rate sufficiently high to insure a good stand under favorable conditions. The seed bed should be thoroughly prepared, and, if possible, planting should be delayed until all danger of injury from frost is past. Once a good stand has been obtained, care should be exercised in thinning out the surplus plants.

Continued experiments in all of the more important cotton-growing States have proved that where properly applied the new single-stalk system of culture will promote earliness in the crop and increase the yield, especially in short seasons. Differences of 10 to 20 per cent are usually obtained, with 40 per cent and upward in special cases. The system is based upon the control of the branching habits of the plant by delayed thinning. Through later thinning the long vegetative branches that are normally produced near the base of the main stalk are suppressed and the bolls on the lower fruiting branches are thus allowed to reach an early normal maturity. Suppression of the vegetative branches causes the plants to make a narrow, upright growth, instead of a spreading bushy growth, which allows closer spacing than usual, without danger of injurious crowding.

The later thinning of cotton proves to have several important advantages, in addition to the suppression of the vegetative branches. The young plants make more rapid growth when they are allowed to stand close together with mutual protection against unfavorable conditions. Extremes of temperature, dry winds, and blowing sand often injure or destroy cotton seedlings. Early thinning increases the exposure to these dangers and also induces more severe attacks of the peculiar disorder known as leaf-cut or tomosis, which leaves many of the plants weakened and deformed. With thinning deferred until after the period of leaf-cut injury, the injured or stunted plants can be removed, to the advantage of the crop.

RELATION OF DISEASE TO COTTON PRODUCTION.

Several diseases of cotton materially lessen the crop. Wilt, caused by a soil fungus, kills the plants and infects the land. It is spreading through the sandy regions, especially in the Coastal Plain. Root-knot, caused by a parasitic nematode or eelworm, is also prevalent through the same region of sandy soils. Anthracnose, caused by a fungus which kills seedlings and attacks to some extent any above ground part of the cotton plant, is most destructive to the bolls. It is the principal cause of boll-rot and occurs throughout the Cotton Belt. Another disease known as Texas root-rot is prevalent in the heavy soils of Texas and the Southwest.

Anthracnose is controllable by a system of crop rotation in combination with the planting of disease-free seed. Wilt is successfully combated by the use of resistant varieties. and the losses from root-rot may be reduced to a minimum by a rotation with immune crops. All of these methods are fairly well worked out, but, nevertheless. the losses are still large because all farmers have not adopted them.

The cotton States east of the Mississippi are now undergoing a great agricultural readjustment on account of the eastward extension of the boll weevil, and there is in consequence a peculiarly favorable opportunity for the reestablisment of cotton culture on a more nearly disease-free basis. The whole movement for agricultural betterment should be organized as a unit centering around this readjustment to the boll weevil. Early varieties of cotton, adapted to cultivation under boll weevil conditions, should be planted. This replacement in the Coastal Plain should be with wilt-resistant varieties which, owing to the manner of seed selection practiced, are also free from anthracnose. In the rest of the cotton belt where wilt and root-rot do not occur, the most profitable variety should be selected and grown from seed free from anthracnose. This can be accomplished through the distribution of disease-free seed from selected farms in the manner that has already been successfully worked out for the dissemination of the wilt-resistant varieties. This plan of anthracnose control has already been introduced into South Carolina.

Diversification of crops is a leading feature of the boll weevil readjustment. The numerous losses due to root-rot should lead to a serious consideration of this disease in all of the sandy soils of the Coastal Plain and sand-hill regions. This means that the principal farm crops planted should be resistant to root-rot. Corn, hay, small grains, velvet beans, beggarweed, and peanuts answer this requirement. Only the root-knot resistant varieties of cowpeas—Iron, Brabham, and Monetta—should be planted. Soy beans should not be recommended for the

Coastal Plain except in new localities where the soil is known to be free from root-knot, but in the Piedmont section this desirable crop should be planted very extensively.

INSECT ENEMIES OF COTTON.

At this time when maximum returns should be obtained for labor invested and capital employed, attention should not only be directed to disease, which takes a heavy toll, but to those insects which either retard the growth of the cotton plant or destroy its fruit.

THE BOLL WEEVIL.

The most destructive pest which has ever established itself in the United States is the Mexican cotton boll weevil. This insect is a small beetle, measuring about one-quarter of an inch in length, and with a head prolonged into a snout. It feeds on the squares, or buds, and on the bolls, or fruit, of the cotton. It lays its eggs in the punctures made by the beak. The eggs hatch in a few days and the development of the insect requires, during the summer, only about two weeks. This development is entirely at the expense of the square or the boll. Consequently, if the weevil attacks the square it absolutely prevents the opening of the flower and if it attacks the boll it destroys at least a part of the fiber and some of the seed.

The insect entered the United States from Mexico in 1892 and has gradually spread into ever-widening areas until it has reached as far east as South Carolina and as far north as cotton is grown. It causes an annual loss to the cotton producers of between 50 and 100 million dollars. In the part of the cotton belt within a hundred miles of the Gulf of Mexico, the production of cotton has been so reduced that in many localities it is impossible to raise the staple profitably.

The principal means of control of this insect have been developed into a system known as the cultural system of control. Briefly, this system consists of the selection of seed for early-maturing cotton, rotation of crops, early planting, thorough cultivation, early picking, and fall destruction of the plants. Since the advent of the weevil the Department of Agriculture has devoted a great deal of attention to the control of the insect and, without doubt, has had a great influence in changing the agricultural system of the South. The damage wrought by the boll weevil in the southern States has caused a considerable change in the financial and tenant systems in vogue, releasing the planters from the obligation to plant cotton. The result of this has been that many more kinds of crops are now planted throughout the South than were planted before the weevil came, and the income from this more diversified agriculture is greater than the income under the old agricultural system, in spite of the fact that the boll weevil has reduced the yield per acre on all land planted to cotton, wherever the insect is established.

THE COTTON BOLLWORM.

The cotton bollworm is a pest which has been in the United States as far back as we have records. It is the same insect which is known as the corn earworm. It also attacks the fruit of the tomato, and many other crops. The bollworm is responsible for a considerable portion of the loss in production of cotton. The adult of this insect is a buff-colored moth with a wing expanse of about one inch. It lays its eggs singly on the cotton plant or in the silk of the corn. The tiny larvæ as soon as hatched begin to bore in the squares or bolls. They go through square after square from the top of the plant, going downward, and when almost mature are capable of destroying full-grown large bolls. When fully grown the larvæ enter the soil, form a cell and pupate. It is while the insect is in this pupal cell that the best control is obtained. During the winter especially, the species is to be found almost entirely in pupal cells. A thorough fall or early spring plowing is very effective in destroying these hibernating stages.

PLANT BUGS.

There are a number of species of sucking bugs which it is necessary to mention as very destructive to the cotton plant. These insects are very active and live entirely by sucking the juices of plants. They ordinarily breed on the weeds around the cotton field, but go to the cotton plant when it is fairly well developed. They are more likely to be found on it than on their native hosts. The bugs begin sucking as soon as they hatch from the egg and practically destroy any square which they puncture. They cause considerable damage to the bolls by staining the fiber and extracting the juice from the seed. Their principal injury, however, is in their transmitting the various diseases of the cotton plant from boll to boll.

THE MENACE OF THE PINK BOLLWORM.

The pink bollworm, so called on account of the color of the larva which infests the bolls and seeds of cotton, discovered near Hearne, Texas, September, 1917, and introduced from Mexico, undoubtedly is the most destructive insect that has threatened the cotton crop of the United States. It not only injures or destroys the bolls and lint, but also the seeds, and greatly reduces the yield of oil. In the larval stage it hibernates in the seed and in this way has been carried to practically all cotton-producing countries of the world. It has worked untold damage to the cotton-growing industries in Egypt, Hawaii, and other countries and the measure of its devastation abroad should stimulate our efforts to keep it from becoming a permanent inhabitant of the cotton fields of the United States. It has gained a foothold across the border in Mexico and this fact calls for untiring efforts to keep it from spreading into the United States.

On September 12, 1917, a single pink bollworm was discovered at Hearne, Texas. Later a few other specimens were found in the original field and adjacent fields. The Department immediately sent inspectors there and destroyed all of the cotton in the infested fields and, as a measure of greater precaution, in many uninfested adjacent fields. Later, November 3, other outbreaks were reported; one near Beaumont, in the neighborhood of a mill which had received seed from Mexico in 1916, the others on Trinity Bay. The outbreaks on Trinity Bay are more serious, both because of the possibility of spread and because of uncertainty of origin, than the outbreak either at Hearne or at Beaumont. The clean-up of these two areas is under way. It will be necessary to invoke the full powers of a recently enacted Texas law authorizing the establishment of cotton-free zones for all these regions and to conduct a thoroughgoing survey of the entire State.

Four years elapsed between the introduction of the insect into Mexico and its discovery there by the Department. The pest apparently was introduced into Mexico through some Egyptian cotton seed in 1911, but its existence there was not brought to the attention of the Department until November 1, 1916, when a specimen of infested bolls was received from the Laguna district. Its discovery was followed by the immediate issuance of an order, which is still in effect, prohibiting the further entry into the United States from Mexico, except from the Imperial Valley, State of Lower California, of all cotton seed, cottonseed hulls, and seed cotton, and bringing under regulation and restriction as to ports of entry Mexican cotton lint of all kinds. Strict rules and regulations governing the importation of cottonseed cake, meal, and other cottonseed products into the United States from Mexico and other foreign countries also were issued to prevent the possible introduction of the insect in the products of uncrushed seed. Accurate information also was promptly obtained of the disposition of the Mexican cotton seed which had come across the border under permit during the season of 1916. A total of 436 cars of Mexican seed entered the United States during the year prior to November 4 and was distributed among several mills in different parts of Texas. Consequently, a clean-up campaign was begun immediately, and steps were taken to expedite the milling or destruction of the seed. A border inspection and control service covering all car, freight, baggage, and other traffic between Mexico and the United States also was organized and is in full operation.

During the growing season of 1917 all cotton fields in the vicinity of the mills which had received Mexican cotton seed were frequently inspected, to determine whether any pink bollworm moths had escaped to these fields. No traces of the insect were found in relation to any of these mills until September 12, when a single specimen was discovered near the Hearne mill, followed, as noted above, by the discovery of the insect in a field near the Beaumont mill. The Trinity Bay outbreaks seem to have no connection with any of the mills which had received Mexican cotton seed. The fields surrounding all the mills involved with Mexican seed will be kept under constant observation and none of the locally grown seed will be used for planting this season. The portion of the crop at the infested points which was not destroyed will be safeguarded, the lint shipped abroad or fumigated, and the seed promptly ground up at the mills, and the old cotton plants pulled up and burned over a wide area to eliminate any risk which might come from overwintering of the insect in undeveloped or dead bolls.

A bill was passed by the Texas Legislature giving the State authorities powers under which they can cooperate with the Department of Agriculture in the establishment of cotton-free zones and local quarantines. To further protect the southern States from infestation by the insect in this country, authority is given to create a cotton-free zone, if necessary, approximately 50 miles in breadth, in Texas along the Mexican border. Similar zones also will be established around any point of infection which has developed now or hereafter may develop in Texas or in other southern States. Supplementing the Texas border work, it is the intention of the Department to keep the cotton grown on the Mexican side of the border under observation and to cooperate with the Mexican Government, local authorities, and plantation owners in stamping out any infestation which may develop within 50 miles of the border. In this way it is hoped to confine the infestation to the interior of Mexico, and particularly to the Laguna district where it is now found.

It is proposed also, in cooperation with the Mexican Government, to conduct a thorough survey of all Mexican cotton regions, to ascertain the present distribution of the insect in Mexico. This survey will ultimately be the basis for determining the possibility of undertaking, in cooperation with Mexico, measures looking to the extermination of the pest in that country. If it should be determined that it is possible to exterminate the pink bollworm there, and satisfactory cooperation with the Mexican Government can be arranged, the most effective and economical method of preventing the further entry of the insect into the United States would be to undertake its eradication in Mexico. To carry out these plans an appropriation of $250,000 was appropriated by Congress on August 6, 1917.

In summarizing the activities which are now under way with respect to the pink bollworm of cotton, they may be divided into five groups:

(1) Thorough inspections of all cotton fields suspected of harboring the pest are being made with a view to detecting at the earliest possible moment infested areas. Where pink bollworms are found the cotton in the infested and neighboring fields is burned and steps are taken to safeguard against the spreading of the pest through cotton seed or cotton lint from that area.

(2) Inspectors are stationed at the principal ports of entry from Mexico, and all rail freight, baggage, and passenger traffic between the two countries is thoroughly safeguarded. Cars, freight, baggage, etc., are disinfected and much movement of freight which would involve risk is being permitted only after it is transferred from Mexican cars and fumigated.

(3) It is proposed to establish a cotton-free zone, approximately 50 miles in breadth, to include certain border counties of Texas. That State has recognized the need of prompt action and is cooperating with the Department of Agriculture in the establishment of this zone and the farmers in this section of Texas are showing an excellent spirit in their willingness to forego the production of their cash crop, cotton, in order to make it more difficult for the pink bollworm to become established within the State.

(4) It is the intention of the Department to keep the cotton grown on the Mexican side of the border under observation and to cooperate with the Mexican Government, local authorities, and plantation owners in stamping out any infestation which may develop within 50 miles of the border.

(5) In cooperation with the Mexican Government it is intended to organize a thorough search to find the present distribution of the pest in Mexico. This may lead to a joint undertaking upon the part of this country and Mexico in exterminating the pink bollworm in that country.

SEED GREATLY INCREASES VALUE OF CROP.

The cotton seed which is separated from the fiber at the cotton gin, and which formerly was considered as a by-product of very little or no value, in recent years has commanded a price equal to about one-third of that brought by the fiber itself. The increase in value, of course, came about through the extension of the use of cotton seed into a great number of commodities. Thus cotton is now a dual crop, producing both fiber and food, not only for the South but for the whole Nation.

and a large part of the rest of the world as well. The total production of cotton seed in this country in 1917, estimated at nearly twice the weight of lint or fiber, approximated 4,881,000 tons. For the same year the farm value of the seed was estimated to be about $69 a ton, making the total farm value of the total seed about $338,644,000.

TABLE 5.—*Production, price, and farm value of cotton and cotton seed, 1912-1917.*

COTTON, EXCLUDING LINT COTTON REMOVED FROM SEED AT OIL MILLS.

Crop of—	Production.	Average price to producers, for season.	Farm value.
	Gross weight, pounds.	*Cents per lb.*	*Dollars.*
1912	6,851,710,000	11.48	786,576,000
1913	7,078,240,000	12.48	883,364,000
1914	8,067,470,000	7.33	591,346,000
1915	5,595,910,000	11.22	627,861,000
1916	5,724,965,000	17.28	989,274,000
		Dec. 1, 1917.	
1917 (preliminary)	5,474,500,000	27.7	1,517,558,000

COTTON SEED.

	Short tons.	*Per ton.*	*Dollars.*
1912	6,104,000	$19.20	117,197,000
1913	6,305,000	22.40	141,232,000
1914	7,186,000	17.90	128,629,000
1915	4,992,000	33.60	167,731,000
1916	5,113,000	50.50	258,206,000
		Nov. 15, 1917.	
1917 (estimated)[1]	4,881,000	69.38	338,644,000

NOTE.—Since cotton is sold at gross weight, including weight of the bales' bagging and ties, the total farm value is computed on this basis.

[1] During 1914-1916, there was an average of 186.41 pounds of seed to 100 pounds of lint (net weight). This average was used to estimate the seed production in 1917. The estimated net weight of lint in 1917 was 5,237,379,000 pounds.

The uses of cotton seed are as varied as they are numerous, as shown by the accompanying diagram, taken from Bulletin 131, of the Bureau of the Census.

PRODUCTS AND USES OF COTTON SEED.

- COTTON SEED.
  - LINTERS
    - Batting.
    - Wadding.
    - Stuffing material for....
      - Pads.
      - Cushions.
      - Comforts.
      - Horse collars.
      - Mattresses.
      - Upholstery.
    - Absorbent cotton.
    - Mixing with shoddy.
    - Mixing with wool in hat making.
    - Mixing with lamb's wool for fleece-lined underwear.
    - Felt.
    - Low-grade yarns....
      - Lamp and candle wicks.
      - Twine.
      - Rope.
      - Carpets.
    - Cellulose ....
      - Writing paper.[1]
      - Guncotton, nitro cellulose, or pyrocellulose.
        - Smokeless powder.
        - Pyroxylin .,..
          - Varnishes . . .
            - Coating for metals.
            - Artificial leather.
            - Waterproofing.
          - Plastics......
            - Celluloid.
            - Collodion.
            - Varnishes.
            - Artificial silk.
            - Photographic films.
  - HULLS ..
    - Feed.
    - Fertilizer.
    - Fuel.[1]
    - Packing.
    - Household utensils.
    - Bran—Cattle feed.
    - Fiber ....
      - Stuffing for horse collars.
      - Basis for explosives.
      - Cellulose—Used same as under Linters.
      - Paper stock—Pressed paper products.
  - MEATS ..
    - CAKE AND MEAL.
      - Fertilizer.
      - Dyestuffs.
      - Feed for....
        - Cattle.
        - Poultry.[1]
        - Horses and mules.
        - Swine.[1]
        - Sheep.
      - Flour[1].......
        - Bread.
        - Cake.
        - Cracker.
    - CRUDE OIL
      - Refined oil.
        - Prime summer yellow oil.
          - Cosmetics.
          - Bleached or deodorized oil.
            - Animal compound lard.
            - Cooking oil.
            - Salad oil.
          - Hydrogenated oil.
            - Lard substitutes.
            - Synthetic stearin—Vegetable-compound lard.
          - Cold pressed oil.
            - Winter oil.
              - Salad oil.
              - Setting olives,
              - Packing sardines,
              - Winter white oil.
            - Stearin—Oleomargarin.
          - Emulsion for medical purposes.
          - Substitute for sweet oil.
          - Deodorized oil.
        - Off-grade summer yellow oil.
          - Soap.
          - Miners' oil.
          - Hydrogenated oil—Synthetic stearin—Soap.
      - Putty.
      - Foots ..
        - Washing powder.
        - Acidulated foots or black grease.
          - Glycerin—Nitroglycerin.
          - Fat acids
            - Candle-pitch.
            - Distilled fat acids.
              - Stearic acid—Candles, Washing powder.
              - Soap.
              - Stearin pitch or cottonoil pitch.
                - Roofing tar.
                  - Composition roofing.
                - Linoleums.
                - Insulating materials.
                - Oilcloth.
                - Waterproofing.
                - Cheap-paint base.
                - Cotton rubber.
                - Artificial leather.
                  - Upholstering.
                  - Bookbinding.
              - Oleic acid.
                - Soap.
                - Washing powder.
                - Fulling ware.
        - Soap.

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[1] Possible uses to which small quantities only are devoted.

When the cotton seed goes to the oil mill from the cotton gin, it is delinted; that is, the short lint or fuzz which normally adheres to cotton seed, especially that of the Upland type, is removed by a close-ginning process. This short lint is called "linters." Probably the greatest demand for linters and other very short cotton fiber at the present time is for gun cotton. The cotton fiber is almost pure cellulose and for that reason is especially well suited to the manufacture of explosives. Linters are used also in the manufacture of absorbent cotton, which is now needed in unusual quantities in army hospitals. Linters often appear on the market in the form of batting, wadding, and stuffing materials for pads, cushions, horse collars, and the like; and they are sometimes mixed with shoddy and with wool in hat making and for fleece-lined underwear.

After delinting, the seed are hulled, that is, the brown, tough seed coats are separated from the kernels or meats, which contain the oil. The hulls are used chiefly as feed and as fertilizer. What fiber adheres to the hulls after the delinting process is now removed and, as in the case of the linters, used as a basis for explosives, as stuffing, or as stock for pressed paper products.

The meats are crushed to remove the oil. After the crushing process, the meats are known as cake, or, if the cake has been ground, as meal. The cake and meal are used to some extent in fertilizers and dyestuffs, but chiefly as feed for cattle, horses, mules and sheep. Because of certain ill effects sometimes produced, cottonseed meal is not extensively used as a swine feed and it has only limited use as a poultry feed. Attempts have been made in the past to make flour from cottonseed cake, and this possibility is receiving added attention at the present time.

The crude oil pressed from the meats is refined and the refined product used in many forms, such as lard substitutes, cooking and salad oils, emulsions for medical purposes, cosmetics, and soap. Putty is a by-product of the refining process, and the residue is known as foots. Foots are used in making soap, washing powder, nitroglycerin, candles, roofing, linoleum, oilcloth, insulating materials, cheap-paint bases, and artificial leather.

COTTON MARKETING.

Only in recent years has the proper perspective between production and marketing been developed; formerly the producer was left to solve unaided the complex problems of marketing. But it profits the farmer little to improve the quality and increase the quantity of any crop unless it can be sold to advantage. This is as true of cotton as of any other products of the farm.

DEMAND FOR BETTER QUALITY OF COTTON.

Cotton mills are experiencing a natural increase in the demand that they manufacture better and finer articles of clothing. With more money per capita, higher wages, and shorter working hours, more attention is given to dress. This, of course, gives the mills a great opportunity for diversification in the manufacture of higher and finer grades of cotton goods, which require a longer staple than the average ⅞ of an inch to 1 inch Upland cotton. The manufacture of tire fabrics for automobiles and balloon and aeroplane fabrics also has produced an unusual demand for extra staple cotton, with the result that greater premiums have been placed upon this cotton than ever before. This increased use of longer staple for a number of specialities, together with the advent of the boll weevil in certain areas where the staple cottons are grown, has strengthened the position of this class of cotton in the market sufficiently to make it remunerative where it can be grown, especially to those who give the necessary thought and attention to the matter of handling such cotton from the time it is planted until it is disposed of to the buyer.

The marked advantage of the longer staple cotton is shown in the quotations for extra staple cotton in New Orleans, for Strict Middling grade, given in the accompanying table. It shows the differences between premiums existing in the month of November for the years 1916 and 1917. These premiums are based on the price of Middling Upland cotton, which was 19.19 cents in 1916 and 27.59 cents in 1917.

Differences between premiums, November, 1916 and 1917.

Length.	Premium.	
	November, 1916.	November, 1917.
Inches.	*Cents.*	*Cents.*
1-1/16	0.28	1.75
1-1/8	2.03	6.50
1-3/16	4.53	12.00
1-1/4	6.53	15.00
1-5/16	7.53	18.00
1-3/8	9.03	20.00

The premiums on Sea Island cotton over Upland cotton for practically the same period also have advanced from 21.59 cents in November, 1916, to 43.00 cents in November, 1917.

Growers may obtain information from their State agricultural college or the Federal Department of Agriculture as to the varieties suited to their locality. In many localities it is not advisable, as discussed earlier in this publication, for the grower to attempt to produce the longer staple varieties. Where the short staple varieties are planted, however, care should be taken to select a variety that will produce a staple at least ⅞ of an inch in length. (See discussion of varieties on pages 9 to 11.) A number of desirable varieties that will give a 1-inch staple are just as productive as the varieties of shorter length.

Cotton with a staple of less than ⅞ of an inch is of approximately the same spinning value as the bulk of the cotton of India. For economic reasons, the American product should be maintained on a higher level of intrinsic value than that of India in order that the American crop may not be forced to compete in the markets of the world with the cheaper qualities of cotton. Localities that produce inferior cotton in appreciable quantities soon establish a reputation for a poor product and the price of all cotton in the community suffers on account of this bad reputation. Competent cotton buyers discriminate against extremely short staple whenever such cotton is discovered. Mills and exporters learn to avoid the localities where such cotton is produced.

In the cotton trade the price of spot cotton commonly is governed largely by future quotations. In order that these quotations might reflect more accurately the value of spot cotton, Congress, in the United States Cotton Futures Act, provided a form of contract, exempt from the tax imposed by the Act, under which cotton of extremely low grade, or which is less than ⅞ of an inch in length of staple, is not deliverable on future contracts. This action by Congress was intended primarily for the benefit of producers. One of its results was the adoption by the New York and New Orleans Exchanges of the form of future contract provided for by the Act, in the fulfilment of which cotton less than ⅞ of an inch in length of staple cannot be delivered.

As the variety of seed planted is the primary factor in determining length of staple, and as there are early-maturing prolific varieties which produce a staple at least an inch in length, no farmer is justified in planting an inferior variety, or in expecting the full market price when he comes to sell such cotton.

SELL COTTON ON ITS MERITS.

In some sections of the cotton belt it is customary for the farmer to sell his cotton in the seed to the ginner. It is imposible to determine accurately before ginning the quality of cotton and the percentage of lint, seed, and trash which it contains. In consequence, buyers of seed cotton base their prices on the average character and outturn of the cotton in the community, and the farmer who produces better cotton than the average often obtains no reward. As a matter of fact, even the producers of average cotton suffer, for the buyer allows himself a wide margin of safety in making his quotations and purchases. The respective loads of cotton that are hauled to the gin show a wide variation in the outturn of lint, seed, and trash, and buyers usually pay the same price throughout the day for all unginned cotton, irrespective of its quality. In most cases the price paid is below what the seed and lint would bring when the farmer has his cotton ginned and sells his lint and seed separately.

Another disadvantage inheres in the practice of selling cotton in the seed. Not only does the farmer lose in the marketing of any one crop, but no incentive is offered him to improve his cotton from year to year, as the buyer of seed cotton pays little or no attention to grade and staple and the producer is forced to think chiefly of the yield per acre. It is also difficult, if not impossible, for the grower to obtain his own seed from the ginner for planting, and he is, therefore, unable to maintain a pure variety. From investigations made by the Department of Agriculture, it is recommended, for the common good of all concerned, that the practice of selling cotton in the seed be discouraged and that each bale be ginned and sold upon its merits.

STANDARDIZATION IS ESSENTIAL.

Standards representing the various qualities of cotton produced are essential as a basis for price quotations and the proper dissemination of market information. The fixing of these standards is necessarily a function of the Government. Standards for the numerous grades of American Upland cotton have been used for practically a century, but unfortunately they varied widely from market to market, and quotations based upon them meant little or nothing to the average producer. Since the passage of the United States Cotton Futures Act in August, 1914, all of the larger cotton markets in the United States have adopted the Official Cotton Standards for grade as a basis for the transactions of their business. These standards also have been officially adopted by the Rotterdam Cotton Exchange.

The Official Standards for grade are Middling Fair, Strict Good Middling, Good Middling, Strict Middling, Middling, Strict Low Middling, Low Middling, Strict Good Ordinary, and Good Ordinary.

The Official Standards for colored cotton are as follows:

Yellow Tinged Cotton of the grade of Good Middling.
Yellow Tinged Cotton of the grade of Strict Middling.
Yellow Tinged Cotton of the grade of Middling.
Yellow Tinged Cotton of the grade of Strict Low Middling.
Yellow Tinged Cotton of the grade of Low Middling.
Yellow Stained Cotton of the grade of Good Middling.
Yellow Stained Cotton of the grade of Strict Middling.
Yellow Stained Cotton of the grade of Middling.
Blue Stained Cotton of the grade of Good Middling.
Blue Stained Cotton of the grade of Strict Middling.
Blue Stained Cotton of the grade of Middling.

It has not been found practicable to attempt to represent by standards in a practical form certain kinds and conditions of cotton that are prohibited from being delivered on future contracts; such as gin-cut cotton, reginned cotton, repacked cotton, false-packed cotton, mixed-packed cotton, water-packed cotton, cotton of perished staple, cotton of immature staple, and cotton of ⅞ of an inch staple. Investigations are being made, however, with a view to establishing standards for length of staple and possibly some of the other qualities that now are not standardized.

The Official Cotton Standards for grade are now being used at the following markets:

New York Cotton Exchange.
New Orleans Cotton Exchange.
Montgomery Cotton Exchange.
Selma Cotton Exchange.
Little Rock Board of Trade.
Mobile Cotton Exchange.
Augusta Cotton Exchange.
Savannah Cotton Exchange.
New England Cotton Buyers' Association, Boston.
Fall River Cotton Buyers' Association.
St. Louis Cotton Exchange.
Vicksburg Cotton Exchange.
Oklahoma State Cotton Exchange, Oklahoma City.
Clarksdale (Miss.) Cotton Exchange.
Yazoo City Cotton Exchange.
Atlanta Commercial Exchange.
Memphis Cotton Exchange.
Galveston Cotton Exchange.
Texas Cotton Buyers' Association, Waco.
Waco Cotton Exchange.
Houston Cotton Exchange.
Dallas Cotton Exchange.
Paris Cotton Exchange.
San Antonio Cotton Exchange.
Norfolk and Portsmouth Cotton Exchange, Norfolk.
Cotton Manufacturers' Association of North Carolina.
Cotton Manufacturers' Association of South Carolina.
Charleston Cotton Exchange.
Fort Worth Grain and Cotton Exchange.
Greenwood Cotton Exchange.
Greenville Cotton Exchange.

The fixing of standards by the Federal Government placed before the farmer a greater opportunity to benefit from a knowledge of the grade of his cotton before sale. Often a buyer judges the farmer's product entirely too casually and offers a safe price, which the grower accepts because he needs the money. This method of selling, which causes farmers heavy losses every year, will yield to a more business-like handling of the crop, when the producer knows more about the grade of his cotton.

The grade is usually the only quality considered when selling most short-staple cotton. Very little regard is paid to the length of the staple, although cotton having a staple of 1 inch is of considerably more value than that having a staple only ¾ of an inch long. Many times discrimination is so careless that even the grade counts for little with the buyer.

However, price quotations from various markets throughout the United States where the Official Cotton Standards are now being used show much more uniformity than existed before their general adoption. Low Middling cotton, ⅞ of an inch to 1 inch in staple, sold early in December, 1917, for approximately ⅞ of a cent below Middling, and Good Middling for approximately ½ of a cent above Middling.

The grade of cotton is determined by three factors; that is, foreign matter, such as leaf dust, sand motes and cut seed; color, and quality of the ginning. To learn to classify all of the grades of cotton requires much experience, but the grower need not know them all. If he learns to recognize three grades, Low Middling, Middling, and Good Middling, he will be able to deal with most of the white cotton grown in the average season. Middling is the basic grade and is the grade upon which the market quotations are based. All grades above Middling should bring a higher price and all below should bring a lower price than that quoted for Middling.

Long-staple cotton, with the exception of Sea Island and Egyptian, is classed according to grade in practically the same way as short-staple cotton. A greater difference of opinion exists concerning the length of staple than concerning the grade. Experts differ considerably in their estimates of the length of the same staple of cotton, sometimes from ⅛ to 3-16 of an inch in the longer lengths. This is probably due to the fact that they do not "pull" the staple in the same way. A rule used for measuring the drawn sample, therefore, is not always a sure index of the length, for one classer may discard more long or short fibers than another. If, however, it were possible for all branches of the trade to have the same type or standard of cotton for 1 inch, 1⅛ inches, 1¼ inches, and longer lengths, there would be more uniformity in this respect.

The failure of many of the smaller markets and a majority of the export trade to use the Official Cotton Standards is still a source of confusion and abuse, which, no doubt, will require Federal legislation to overcome entirely. A bill is now pending in Congress, known as the Cotton Standards Bill, which authorizes the Secretary of Agriculture to establish uniform standards of classification for cotton, to provide for the application, enforcement, and use of such standards for transactions in interstate and foreign commerce, to prevent deception therein and for other purposes. The primary purpose of the bill is to enforce the uniform application of the Official Cotton Standards in spot transactions in interstate and foreign commerce. This would greatly simplify existing conditions in the spot cotton business of the United States, and would ultimately bring about greater profits to the producer.

The bill provides for the licensing and supervision of the work of cotton classifiers by the Department of Agriculture. These classifiers will determine the grade of cotton while it is still in the producer's hands. This, connected with the accurate quotations provided for under the Cotton Futures Act, would place the farmer in position to know the value of his product before placing it on the market for sale. Provisions also are made for the settlement of disputes as to classification of cotton, arising in the settlement of spot sales of cotton that has been previously classed by a licensed classifier. In other words, the enactment of the measure would give to persons interested in spot cotton the same privileges accorded dealers in future contracts, and thus the spot-cotton industry in the United States would have access to an impartial tribunal for the settlement of disputes as to classification. It is believed that the provisions of this bill would establish the cotton business in the United States on an equitable basis for all concerned.

COOPERATION MAKES FOR ADVANCEMENT.

The individual farmer is rarely in a position to secure the proper information relative to market conditions and the value of the cotton he has for sale. Often his cotton is hauled to market with only a knowledge of what his neighbor received for cotton the previous day. The organized and concerted effort of the community as a whole is essential in the marketing of their product, if permanent and satisfactory improvements are to be accomplished. Such organization makes it possible for the farmer, when he is ready to sell, to secure the advice and services of a cotton expert, and also admits of better ginning, storage, and handling facilities in general, as well as maintaining uniformity in the production of a suitable variety and quality of cotton.

Within the last three or four years a number of such cooperative associations have been formed throughout the cotton belt and these have succeeded in the production of uniform lots of cotton, the building of gins for the ginning of this cotton, and the employing of graders to give them expert assistance in the marketing of their cotton. Examples of such organizations are found in the Imperial Valley Long Staple Cotton Growers' Association, El Centro, California; Tempe Cotton Exchange, Tempe, Arizona; Scott Cotton Growers' Association, Scott, Arkansas; Beulah Marketing Association, Beulah, Mississippi; and the Denton Marketing Association, Denton, Texas.

When practicable, the services of cotton experts are furnished by the Bureau of Markets to communities of cotton growers for the purpose of demonstrating the use of the Official Cotton Standards and the value of knowing the grade of their cotton before sale. County demonstration agents also have been supplied with sets of these standards, which are available for the use of the farmers in marketing their cotton.

At Montgomery, Alabama; Glendora, Mississippi; Waxahachie, Texas; Purcell and Blair, Oklahoma, and a number of other points, the growers have organized for the purpose of building cooperative gins, and, in some instances, oil mills, for crushing their cotton seed.

Farmers growing a certain variety of cotton, especially cotton of long staple, may well afford to own a suitable gin to be used only for this variety, thereby obtaining a better sample as well as keeping their seed pure. A large amount of the longer lengths of cotton is badly damaged by being ginned on the ordinary saw gin. When this type of gin is used, the saws should be wider apart, and run at a lower speed (about 300 revolutions per minute on green cotton and about 350 on seasoned cotton). The grids in saw gins intended for the ginning of long-staple cotton also should be specially constructed.

All cotton, both short and long, should be dry before ginning, and the quality of covering used for the bales also should receive better attention. From 6 to 6½ yards of jute bagging, weighing approximately 2 pounds to the yard, is used for covering a bale of cotton. Six yards, that is, 3 yards to each side, is sufficient for the standard bale, which is 54 inches in length. Many of the gins purchase second-hand jute bagging that has been removed from the bales of cotton at the mills. The holes in this bagging are usually mended or patched at the mill, thus increasing the tare and tending toward the production of a ragged, inflammable, and dirty bale of cotton. Should there be a demand from the growers for the use of a better covering for their cotton, the gins, no doubt, would grant it, and the second-hand bagging would be rewoven or used for other purposes.

During the present emergency it is exceedingly important that all gins cooperate in the matter of standardizing the dimensions and density of the bale. This would effect a great saving in freight, tonnage, and storage space by making it possible to load the maximum number of bales. Those who have not adopted the 54 by 27-inch gin box are urged to take steps immediately to adjust the gin boxes to this size. This can easily be done at a small cost, perhaps $10 or $15 per box. The majority of gin boxes are now of uniform size; that is, 54 by 27 inches, and the manufacturers of ginning machinery are now making boxes only of these dimensions. A number of plantations, however, continue to use boxes of various dimensions, and a few odd-size bales, which seriously interfere in the loading of freight space to its maximum capacity, are usually found in every shipment.

THE NEW WAREHOUSE ACT.

The average cotton grower is not in a position to store a very large proportion of his cotton unless he is benefited beyond the mere sheltering and care for the cotton. The bulk of the crop is sold as fast as it is ginned in order to settle obligations that are due, and thus the advantages of a gradual marketing of the crop are lost to the grower, and usually to those who are in most need of such assistance. However, cotton is rarely properly housed on the farm. The bales are often left exposed to the weather for months, resulting annually in a large economic loss from the rotting of the fiber—known as "country damage."

It is believed the passage of the United States Warehouse Act, August 11, 1916, is a very important step in the direction of permanent improvement in cotton marketing. Growers can organize to build and operate a bonded warehouse, a Federal license can be obtained on application to the Federal Department of Agriculture, and such produce as cotton, wool, grain, tobacco, and flaxseed may be graded according to the official standards and stored therein. The Federal warehouse receipt, which testifies to the quantity and quality of the produce thus stored by the farmer, is good security that will be recognized as such by any bank which is a member of the Federal Reserve system. The farmer's note, backed by such security, may be rediscounted by his bank at the Federal Reserve Bank at the lowest rate of discount. Thus, every farmer, by joining in a warehouse organization or company, may be able to have his cotton so assembled, graded, stored, and marketed as to secure its full value. If he wishes to hold his cotton for a more favorable market, instead of accepting whatever the buyer may offer, the Federal warehouse receipt will entitle him to bank accommodations on the most reasonable terms. More warehouses at the primary markets will be necessary in order that the growers may receive the full benefits offered by the provisions of the Act. In cooperative marketing, also, the warehouse is an important adjunct, making it feasible to concentrate and sell, at a premium, in even-running commercial lots.

GREATER COMPRESSION ECONOMICAL.

At the present time extraordinary methods should be adopted to compress cotton to a greater density in order to economize in the use of freight cars, tonnage, and storage space. The ideal system, which is being successfully carried out at several points, would be the compression of cotton to its final density when ginned at the primary markets. This method of compression is followed successfully and almost entirely in British India. A more general use of the gin compression, of either the round-bale or square-bale type, which gives a density of about 33 pounds per cubic foot, would accomplish this and should be encouraged where the volume of business will admit. This would eliminate extra loading and handling, and superfluous sampling at the railroad compresses, as well as effect a great saving of freight cars. Under the present practice, the bulky bales which are pressed to a density of only 12 to 15 pounds to the cubic foot at the gin are hauled to some concentration point, unloaded, and recompressed by what is generally known as the railroad compress, to a density of 22 to 24 pounds before the cotton is loaded for its final destination. This involves a large amount of detail work and the use of approximately one-third more freight cars for the movement of the cotton crop.

Under the present method of handling cotton, the high-density compress, which gives a density of 35 to 37 pounds per cubic foot, should be used as far as possible at the terminal points. High-density presses are now located at such terminals as New Orleans, Mobile, Galveston, and Houston. A railroad car 36 feet long will hold 30 bales of uncompressed cotton, which has a density of 12 to 15 pounds per cubic foot; or 65 bales of the ordinary railroad compressed cotton with a density of 22 to 24 pounds per cubic foot; or 115 bales of the high-density compressed cotton with a density of 35 to 37 pounds per cubic foot. Recent tests made by the Bureau of Markets indicate that cotton may be safely compressed to a density of 35 pounds per cubic foot without damaging the spinning quality of the fiber.

Railroads and steamship companies are in a position to encourage shippers and compressors in the better packing and compressing of cotton by making a rate commensurate with the increased compression given to cotton bales with a view to admitting of the maximum loading of cars or tonnage space; also by penalizing bales that are of improper dimensions or density.

The jute bagging or patches used at the compressors for covering the holes cut in the bale for sampling should be of a standard 2-pound-per-yard weight, and the amount of patching should be reduced to the minimum for both domestic and foreign shipments. The shippers, no doubt, could bring about a more general adoption of the practice of selling cotton on a basis of net weight. This would eliminate the custom of adding superfluous tare at the compresses in order to insure the maximum amount of tare allowed by the trade. The American mills allow 24 pounds of tare per bale, while the c. i. f. and 6 per cent (cost, insurance, freight and 6 per cent allowance on invoice) contract of the American exporter stipulates that the cotton is to be invoiced at the actual gross weight, less the allowance of 6 per cent. The actual amount of tare allowed by the foreign markets under this contract is about 26½ pounds per bale. This allowance, of course, is taken into account when the purchase is made, either in domestic or foreign sales, and naturally the shipper makes sure that the amount of tare permissible is placed on each bale.

Six to 6½ yards of jute bagging, weighing 2 pounds to the yard (varying from 1¾ to 2¼ pounds per yard) is usually placed on the uncompressed bale at the gin. When recompressed, seven ties weighing about 9 pounds are added. This, without the addition of extra patches, would make a total of 21 to 22 pounds of tare, which should be sufficient to protect the bale when properly handled. The general custom, however, is to patch all bales at the compress, increasing the tare by 3 to 6, or more, pounds per bale, the average being about 6 pounds per bale. On a 12,000,000 bale crop this excess tare alone would amount to 72,000,000 pounds, or the equivalent of 144,000 bales of cotton, requiring about 2,200 freight cars for transportation.

It is evident, therefore, that our present method of handling the cotton crop, from the time it is picked in the field until it ultimately reaches the consumer, is susceptible of a marked improvement.

SUMMARY.

Even more than before the war, the world at present looks to the United States for its chief supply of raw cotton. The situation therefore should be considered carefully, with reference particularly to the kind of cotton grown, whether it should be long-staple or short-staple.

As shipping difficulties have reduced our imports of Egyptian cotton, and Sea Island has been abandoned in some areas because of the boll weevil, our supply of long-staple cotton has become inadequate, and cotton growers not in position to produce the Egyptian or Sea Island types should substitute long-staple Upland varieties, where possible, in place of short staples. The demand for short staples can be met from those extensive areas in which it is impracticable to grow any of the long staples.

Deficiency in supply of long-staple cotton began with the advance of the boll weevil to the Mississippi Delta region, which caused substitution of short-staple varieties for the long staples formerly grown there. Manufacturers then adjusted their machinery to the short staple, and this reduced the demand for long staples and further reduced the production.

Demand for long-staple cotton undoubtedly will continue after the war, because of its recognized superiority in the manufacture of special fabrics—automobile tires, for instance—and no large increase in production of such staples can reasonably be expected at present from any other country than the United States.

Community organization of growers, with cooperation of manufacturers, is needed. Production of a single superior variety in a community prevents cross-pollination in the field and mixture of seed at the gin, and aids in maintaining the quality of the stock by selection. It furnishes commercial quantities of a uniform fiber, and raises the price of the crop, besides improving the facilities for handling.

Increase in the production of cotton from the low level of the last three years is highly desirable. It should be accomplished chiefly by increasing the yield per acre, and a greater proportion of the total crop should be of the long-staple types.

Rather than increase acreage, both the yield and the value of the crop can be raised, in most sections, by adopting superior varieties and improved methods of culture, with little increase in cost of production.

On the northern edge of the Cotton Belt and where drought or weevil infestation shortens the season, early-maturing varieties of superior quality should be used. The Department of Agriculture has developed and introduced several superior varieties, some adapted to particular sections. Several good commercial varieties also are on the market. These should be selected with reference to their adaptability to the sections in which they are to be used.

In southwestern irrigated valleys, Egyptian and long-staple Upland varieties can be grown, but where Egyptian is planted no other cotton should be used, to avoid deterioration by mixing. Such a policy in many cases would necessitate community action.

After choosing a superior variety, the cotton grower should use seed with a high percentage of germination and plant enough to secure a good stand, in a thoroughly prepared seed bed, later thinning out surplus plants. The new single-stalk system of culture promotes earliness and increases the yield, by delaying the thinning. This system suppresses the long vegetative branches near the base of the main stalk and allows the bolls on the lower fruiting branches to mature early and normally. Closer spacing also is allowed, and other advantages are gained.

The boll weevil, the bollworm, and certain plant bugs are serious insect pests of the cotton plant in this country, and the pink bollworm has recently made its appearance.

Since its appearance in Texas in 1892, the boll weevil has spread over the greater part of the Cotton Belt. In some places it prevents the raising of cotton, and it causes a total loss of from 50 to 100 million dollars. Control of this pest depends upon a cultural system including seed selection, rotation, early planting, thorough cultivation, early picking, and fall destruction of the plants. The fight against the weevil has caused a diversification of agriculture in the Cotton

Belt, with a resulting increase in income, although the yield of cotton per acre is less wherever the weevil is established.

The cotton bollworm, which causes considerable loss, is best destroyed in its hibernating stage by thorough fall or early spring plowing.

The pink bollworm of cotton, a serious menace to our cotton crop, was discovered near Hearne, Texas, in September, 1917, where it had been introduced from Mexico. It is the most destructive insect that has threatened the cotton crop. It destroys bolls, lint, and seed. The Department of Agriculture at once sent men to destroy all the cotton in the infested fields, but other outbreaks were found near Beaumont and on Trinity Bay. The original area was cleaned up and vigorous work is going on in the other areas. A Texas law authorizing cotton-free zones is being invoked and a survey of the entire State, searching for other areas of infestation, is being made.

The United States Department of Agriculture learned of the pink bollworm's presence in Mexico in November, 1916, and an order was issued prohibiting the importation of cotton seed, cottonseed hulls, and seed cotton from that country. The importation of other cottonseed products was placed under strict regulation.

Texas is cooperating with the Federal Government and if necessary a cotton-free zone 50 miles wide will be established along the Mexican border, besides similar zones around any points of infestation, in Texas or other States.

A survey in cooperation with Mexico may be made to learn the distribution of the insect in Mexico, with a view to adopting measures to exterminate it in that country. Congress made an appropriation of $250,000 in August, 1917, to carry out this plan.

Cotton seed, formerly a waste product, now is subjected to processes which separate the linters, the hulls, and the meat, and these products have many uses. The value of the total cottonseed crop is practically one-fourth that of the lint from which it comes.

Wilt, root-knot, anthracnose, and Texas root-rot are diseases which materially lessen the yield of cotton. Wilt is combated by using wilt-resistant varieties. Rotation with crops immune to root-knot reduces losses from that disease. For anthracnose, rotation and disease-free seed are the remedies.

As agricultural readjustment to meet the weevil conditions goes on east of the Mississippi, early varieties, adapted to such conditions, should be planted. In the Coastal Plain they should be wilt-resistant. Elsewhere, if wilt and root-knot are not present, anthracnose-free seed from selected farms should be distributed. In diversifying crops in sandy soils in the Coastal Plain and Sand Hill regions, crops resistant to root-knot should be chosen.

Increasing demand for long-staple cotton for special uses has increased the premium paid for such cotton. At New Orleans, for instance, the premium paid for Strict Middling grade in November, 1917, was 1.75 cents for $1\frac{1}{16}$ inch staple against 0.28 cent in November, 1916, and for $1\frac{3}{8}$ inch staple the premium rose from 9.03 cents in 1916 to 20 cents in 1917—showing marked advantage for the longer staple. Though in some localities it is not advisable to grow the longer staple varieties, no variety should be selected that does not produce at least a $\frac{7}{8}$ inch staple, as buyers discriminate against extremely short staple, which is not deliverable on future contracts.

The cotton grower should have his cotton ginned, and sell the lint and seed separately; otherwise he receives a price kept down by his neighbor's trashy cotton.

Since the passage of the United States Cotton Futures Act in August, 1914, transactions in cotton futures are in accordance with official standards established by the Secretary of Agriculture. All the larger cotton markets in the United States have adopted the Official Cotton Standards for grade as a basis for all their transactions. With these standards in use the farmer is better able to judge whether he is receiving a fair price for his cotton. He should learn to recognize the three grades, Low Middling, Middling, and Good Middling. Grades above Middling should bring a higher price and those below a lower price than that quoted for Middling.

Many smaller markets and a majority of the export trade do not use the Official Cotton Standards. A bill now pending in Congress, known as the Cotton Standards Bill, would provide uniform standards of classification for cotton, to be used in all spot transactions in cotton in interstate and foreign commerce, the cotton to be classified while still in the hands of the producer. The farmer would be enabled to know the value of his cotton before placing it on the market and all concerned could deal on an equitable basis.

For satisfactory marketing, the individual farmers should organize. In the last three or four years cooperative associations have operated with success, producing uniform lots of cotton, building gins and oil mills, and employing expert graders.

Cotton should be dry before ginning and the bale should have good covering. Gin boxes should be uniformly 54 by 27 inches.

Under the United States Warehouse Act, growers can store their cotton in their own bonded warehouses, and can borrow from Federal Reserve Banks on the warehouse receipts.

Cotton bales should be condensed to greater density. Gin compression to a density of 33 pounds per cubic foot would reduce the handling necessary, as well as the number of freight cars required to carry the crop. If this change is not made, then the high-density compress, giving a density of 35 to 37 pounds, should be used at terminal points. A car which will hold 30 bales of uncompressed cotton will hold 65 bales of the ordinary railroad compressed cotton, or 115 bales of the high-density compressed cotton.

If cotton in the bale were sold by net weight, the custom of adding superfluous tare to bring the tare up to the full amount allowed would be eliminated, and 2,200 less freight cars would be needed to move the crop.

In brief, our method of handling the cotton crop, from the time it is gathered in the field until it reaches the consumer, might be improved greatly.

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